

#210

APOLLO 15 & 17

HEAT FLOW THERMAL CONDUCTIVITY

71-063C-06A

72-096C-01A

APOLLO 17 LM/ALSEP

HEAT FLOW, THERMAL CONDUCTIVITY

72-096C-01A

This data set has been restored. There were originally two 7-track, 800 BPI tapes written in Binary. There is one restored tape. The DR tape is a 3480 cartridge and the DS tape is 9-track, 6250 BPI. The original tapes were created on a 1130 computer and the restored tapes were created on an IBM 9021 computer. The DR and DS numbers along with the corresponding D numbers are as follows:

DR#	DS#	D#	FILES	TIME SPAN
DR005597	DS005597	D019539 D019540	1 2	12/12/72 - 12/28/74 12/12/72 - 12/28/74

See 71-063C-06A

APOLLO 15 LM/ALSEP

HEAT FLOW, THERMAL CONDUCTIVITY

71-063C-06A

This data set has been restored. There were originally two 7-track, 800 BPI tapes written in Binary. There is one restored tape. The DR tape is a 3480 cartridge and the DS tape is 9-track, 6250 BPI. The original tapes were created on a 1130 computer and the restored tapes were created on an IBM 9021 computer. The DR and DS numbers along with the corresponding D numbers are as follows:

DR#	DS#	D#	FILES	TIME SPAN
DR005595	DS005595	D019537 D019538	1 2	07/31/71 - 12/28/74 07/31/71 - 12/28/74

<u>REQ. AGENT</u>	<u>RAND NO.</u>	<u>ACQ. AGENT</u>
WPP	RB3291	RWV
CMM	RC0825	
JVD	RC3820	

APOLLO 15 & 17

HEAT FLOW THERMAL CONDUCTIVITY

71-063C-06A

72-096C-01A

These data sets consist of 2 Apollo 15 and 2 Apollo 17 data tapes. They are 7-track, 800 BPI, binary, produced on an IBM 1130 computer. The time, located in word 1 of each logical record, is measured in milliseconds since the beginning of 1971.

The tapes contain 5 types of logical records. Each record type is written as a group. For instance, on Apollo 15 tape D-19537, the first 281 physical records are type 1, the next 281 records are type 2, the next 6 are type 4, etc (the labels on the tape indicate the number of records of each record type on the tape). Each record type contains its own time span. The time spans may vary for each record type. Therefore, the actual time span for a tape might be found in the middle of the tape.

Also, the records are written chronologically backwards on each tape. That is, the first logical record of each physical record contains the latest time for that physical record.

The time spans for the tapes are as follows:

APOLLO 15 71-063C-06A

<u>D#</u>	<u>C#</u>	<u>FILES</u>	<u>TIME SPAN</u>	<u>PROBE#</u>
D-19537	C-15748	1	7/31/71 - 12/28/74	2
D-19538	C-15749	1	7/31/71 - 12/28/74	1

APOLLO 17 72-096C-01A

D-19539	C-15750	1	12/12/72 - 12/28/74	2
D-19540	C-15751	1	12/12/72 - 12/28/74	1

DESCRIPTION OF APOLLO HEAT FLOW EXPERIMENT DATA TAPES

I. Tape Specifications.

These tapes were written on an IBM 1130 Model 2415 tape unit at a density of 800 BPI with odd parity, data convert on and translate off. They are 7-track tapes. There are standard IBM inter-record gaps and a standard IBM end of file (2 consecutive inter-record gaps) at the end of the data.

II. Data Organization.

For each heat Flow experiment (Apollo 15 and 17) there are two data tapes, one for probe 1 and one for probe 2. On each tape there are five groups (files) of data in the indicated order:

File #	Record Content	Logical Record size	Physical Record Size
1	Time, $T, \Delta T$ for upper section gradient bridge	3 real words	100 logical records
2	Time, $T, \Delta T$ for lower section gradient bridge	"	"
4	Time, $T, \Delta T$ for upper section ring bridge	"	"
5	Time, $T, \Delta T$ for lower section ring bridge	"	"
3	Time, HTR, TREF, TC1, TC2, TC3, TC4	7 real words	"

Time is measured in milliseconds, since the beginning of the year in which the experiment was activated.

T is the average temperature for a given bridge

ΔT is the temperature difference between the upper and lower ends of a bridge.

HTR is the heater state - an integer between 1 and 16 converted to real mode.

TREF is the reference bridge temperature.

TC1, TC2, TC3, and TC4 are the thermocouple temperatures for each probe cable.

All temperatures and temperature differences are in degrees absolute and the order of the logical records in each file is chronological.

Note: This description applies to the data array for a physical record in core before it is written on tape. When the data are written on tape, the order is reversed; that is, for each physical record, the first word, in core (a time) becomes the last word on the tape record, and the last word in core (either a ΔT or TC4) becomes the first word on tape.

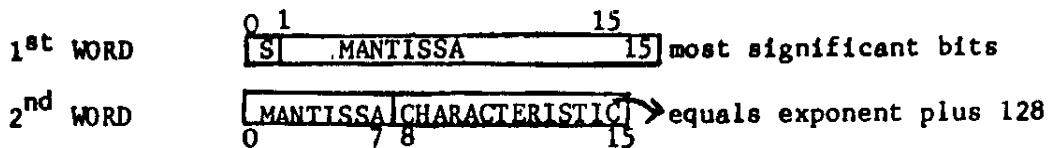
Each tape contains all the data for a particular probe since the experiment was activated until the end of 1974. The first time on the Apollo 15 tapes is 1971/212/19/48/00. The first time on the Apollo 17 tapes is 1972/347/3/5/40. The nominal data density is one point (Logical record) per hour.

The number of physical records for files 1 through 5 for these tapes are:

Tape	Experiment	Probe #	Sequence #	Number of Physical Records for					
Designation	A15 A17	1 2	1 2 3 4	File #1	2	4	5	3	
A15P1#3	X	X	X	291	291	7	7	299	
A15P2#3	X	X	X	281	281	6	7	289	
A17P1#2	X	X	X	207	207	4	4	210	
A17P2#2	X	X	X	206	206	4	4	210	

FORMAT
71-063C-06A

Apollo 15 Heat Flow Thermaldata (71-063C-06A) is written in IBM 1130 Floating point. 1130 Floating point uses two words in storage, and is oriented as follows:



The number can contain up to 23 significant bits of mantissa, with a binary exponent ranging from -128 to plus 127. The sign of the mantissa is in bit zero of the first word. The next 23 bits represent the mantissa, and the remaining 8 bits represent the characteristic. The mantissa is normalized to fractional form, i.e., the implied binary point is between bits zero and one. The characteristic is derived by adding 128 to the exponent, thereby representing all exponents as positive numbers in core. This eliminates the problem of having to allow for a sign bit for the exponent. All characteristics between 0 and 127 represent negative exponents, and characteristics from 128 to 255 represent exponents from 0 to 127 (positive). The exponent is, in actuality, the number of places that the binary bit should be moved either to the left or right of its original position.

The following is an example of how to convert eight hex characters into a decimal equivalent:

sign bit and
mantissa
448081A3 ----characteristic

1) Break the mantissa down into bits.
implied sign bit
binary point
0.100 0100 1000 0000 1000 0001

2) Then calculate the characteristic, and from that, the exponent.

$$\begin{array}{r} A3 = 163 \\ \quad\quad\quad 163 \\ \quad\quad\quad -128 \\ \hline \quad\quad\quad 35 \end{array} \quad \text{exponent}$$

3) Now extend the mantissa out 35 places to the right to locate the correct position of the binary point (padding with zeros if necessary).

sign bit
0.100/0100/1000/0000/1000/0001/0000/0000/0000/
padding relocation of binary point

4) Then convert to hex characters, starting from right to left.

4 4 8 0 8 1 0. 0 0

This is your hex number. In this case, converting to decimal, we obtain a value in milliseconds of the year, which is 18,388,357,120--or 212.828 days.

PAGE 1

/ JCB CA21
LCC DRIVE CART SPEC CART AVAIL P/MY DRIVE
CCCC CAF5 CAF5
CCCC CA21 CA21
CCCC 00C1
00C1

V2 M11 ACTUAL 16K CONFIG 16K

// FTR

*LIST ALL
*CNE WERE INTEGERS
*ICCS(C)ISK,14C3 PRINTER,PAPER TAPE,CARD)

C-ERRS...•••STNC.C.... F C R T R A N S O U R C E S T A T E M E N T S ••••• IDENTFCN

COMPILER MESSAGES

INTEGER FTR
DIMENSION JP(15),IV(5),JNDX(5),IP(5)
DIMENSION A(70C)
DATA JNCDX/1.0,4.5,2/
DEFINE FILE 7(1,7,L,IF7)
DEFINE FILE 1(30CCC,4,L,IF1)
DEFINE FILE 2(3000C,4,U,IF2)
DEFINE FILE 3(30CCC,8,U,IF3)
DEFINE FILE 4(1200,4,U,IF4)
DEFINE FILE 5(12CC,4,U,IF5)
READ(2,2CCC) TI,IF
2CCC FORMAT(1X,2F13.0)
WRITE(5,20CC) TI,TF
READ(7,1) T,IP
WRITE(5,5CCC) IP,T
5CCC FORMAT(5(1X,15),2X,F13.0)
CC 2,1,1,4
J=JNCDX(1)
L1=1
22 READ(J,L1) T,IX,IV
L1=L1+1
1FL1-T1) 22+22+22
23 L2=L1-1
L1=L1-2
2C CC 21 L=1,10C
REAC(J,L2) T,IX,IV
L2=L2+1
1FL2-1IP(J)-11) 27+27+25
27 IF(T-TF) 24+25+25
24 M=L-1
A(3*M+1)=T
A(3*M+2)=IX/10CC.
21 A(3*M+3)=IV/10C.
CALL MAGTA(2,0,3CC,A,2)
GO TO 2C
25 L3=3*(L-1)+1
DC 26 L=L3,3CC
26 ALL=C.
CALL MAGTA(2,0,3CC,A,2)
JP4(J)=L2-L1)/1CC+1
2 CONTINUE
L1=1
32 READ(3,L1) T,FTR,IV
L1=L1+1

C-ERRS...STNCC..... FCRTTRAN SOURCE STATEMENTS IDENTFCN **COMPILER MESSAGES**

```

IF(T-T1) 32,32,33
33 L2=L1-1
L1=L1-2
3C DC 31 L=1,1CC
READ(3,L2) T,HTR,IV
L2=L2+1
IF(L2-(IP(3)-1)) 37,37,35
37 IF(T-TF) 34,35,35
34 M=L-1
A(7*M+1)=1
A(7*M+2)=TTR
A(7*M+3)=IV(1)/IC.
A(7*M+4)=IV(2)/IC.
A(7*M+5)=IV(3)/IC.
A(7*M+6)=IV(4)/IC.
31 A(7*M+7)=IV(5)/IC.
CALL MAGTA(2,0,7CC,A,2)
GO TO 3C
35 L3=7*(L-1)+1
DC 36 L=L3,7CC
36 ALL)=0.
CALL MAGTA(2,0,7CC,A,2)
JP(3)=(L2-L1)/1CC+1
CALL MAGTA(5,0)
CALL MAGTA(3,C)
WRITE(5,500C) JP
CALL EXIT
END

```

VARIABLE ALLOCATIONS

A(R)=CSAC-002A	TIR)=CSA2	TF(R)=05A4	TIR)=05A6	JP(1)=05AC-05A8
JNDX(I)=C5B6-05B2	IP(1)=C5B8-C5B7	HTR(I)=05BC	IP7(I)=C5BD	IF1(I)=05BE
IF2(I)=C5CC	IF4(I)=C5C1	IF5(I)=05C2	I(I)=05C3	IF2(I)=05BF
IX(I)=C5CE	IV(I)=05C7	L2(I)=05C8	L(I)=05C9	L1(I)=05C5
				L3(I)=05CB

STATEMENT ALLOCATIONS

2CTC=C5EA 5000=05EE	22=C63F	23=0661	27=0683	21=06A5
2=06FE 32=07C8	33=C71F	37=0748	34=0752	35=07CD

FEATURES SUPPORTED

CNE WORD INTEGERS
STANDARD PRECISION
ICCS-
DISK
14C3 PRINTER
PAPER TAPE
CARE

CALLED SUBPROGRAMS	FSUB	FCIV	FLC	FSTC	FLOAT	CARD2	PART2	SRED	SWRT	SCOMP	SPIC	SICAI	SIOF
PAGTA	FSUB	FCIV	FLC	FSTC	FLOAT	CARD2	PART2	SRED	SWRT	SCOMP	SPIC	SICAI	SIOF
SUBSC	PRNZ	SEFIC	SRRED	SDAI	SDF	SDI							
REAL CONSTANTS	.1CCCCCE C3=C5DA .CCCCCCE CC=C5DC .100000E 02=C5DE												
.1CCCCCE C4=C5D8													
INTEGER CONSTANTS	1=05E3 4=05E4 1CC=05E5 0=05E6 30C=05E7 3=C5E8 3=C5E9												
2=C5EC 5=C5E1	7=C5E2												

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CCRE REQUIREMENTS FOR -
COMMNC- C. VARIABLES AND TEMPORARIES- 1496, CONSTANTS AND PROGRAM- 570

END OF SUCCESSFUL COMPILATION

/* EXEC 2

*FILES(1,G11,A21),(2,G12,A21),(3,TCP1,A21),(4,R11,A21),(5,R12,A21)

*FILES(7,PNTR,A21)

29C33 29033 C.2C0000012736.
291 29846 615 616
299 7 7 12631379168C.

— APOULLO 15, Probe 1, Tape 3 —

PAGE 1

11 JCE OA22
LOG DRIVE CART SPEC CART AVAIL PHY DRIVE
CCCC CAF5 CAF5
CCCC CA22 CA22
CCCC CCC1

V2 P11 ACTUAL 16K CONFIG 16K

11 FTR *LIST ALL

*CNE WRC INTEGERS

*ICCS(CISK,14C3 PRINTER,PAPER TAPE,CARD)

C-ERRS...STNC.C..... FORTRAN SOURCE STATEMENTS IDENTFCN **COMPILER MESSAGES**

INTEGER PTR
DIMENSION JP(5),IV(5),JNDX(5),IP(5)
DATA JNDX/1,2,4,5,2/
DEFINE FILE 7(1,7,U,IF7)
DEFINE FILE 1(2000C,4,U,IF1)
DEFINE FILE 2(3000C,4,U,IF2)
DEFINE FILE 3(3000C,8,U,IF3)
DEFINE FILE 4(11200,4,U,IF4)
DEFINE FILE 5(11200,4,U,IF5)
READ(2,2CCC) TI,TF
ZCCC FORMAT(1X,2F13.0)
WRITE(5,2CCC) TI,TF
READ(7,1) T,IP
WRITE(5,5CCC) IP,T
5CCC FORMAT(1X,15),2X,F13.C)
CC 2 I=1,4
J=JNDX(I)
L1=1
22 READ(J,L1) T,IX,IY
L1=L1+1
J=L1-1 22,22,23
23 L2=L1-1
L1=L1-2
20 CC 21 L=1,10C
READ(J,L2) T,IX,IY
L2=L2+1
IF(L2-(IP(J)-1)) 27,27,25
27 IF(T-TF) 24,25,25
24 N=L-1
A(3*N+1)=T
A(3*N+2)=IX/10CC.
21 A(3*N+3)=IY/10C.
CALL MAGTA(2,C,3CC,A,2)
GC TC 2C
25 L3=3*(L-1)+1
CC 26 L=L3,3CC
26 A(L)=C.
CALL MAGTA(2,C,3CC,A,2)
JP(J)=(L2-L1)/1CC+1
2 CONTINUE
L1=1
32 READ(3,L1) T,TR,IV
L1=L1+1

C-ERRS...STNC.C..... FCRTRAN SCURCE STATEMENTS IDENTFCN **COMPILER MESSAGES**

```

33 L2=L1-1      32,32,33
  L1=L1-2
30 DC 21 L=1,1CC
  REAC(3,L2) T,PIR,IV
  L2=L2+1
  IF(L2-(IP(3)-1)) 37,37,35
37 IF(T-TF) 34,35,35
34 N=L-1
  A(7*M+1)=T
  A(7*M+2)=TIR
  A(7*M+3)=IV(1)/1C.
  A(7*M+4)=IV(2)/1C.
  A(7*M+5)=IV(3)/1C.
  A(7*M+6)=IV(4)/1C.
31 A(7*M+7)=IV(5)/1C.
  CALL PAGTA(2,0,7C0,A,2)
  GC TC 3C
35 L3=7*(L-1)+1
  DC 36 L=L3,7C0
36 A(L)=0.
  CALL PAGTA(2,C,7CC,A,2)
  JP(3)=(L2-L1)/100+1
  CALL PAGTA(5,0)
  CALL PAGTA(3,C)
  WRITE(5,5CCC) JP
  CALL EXIT
END

VARIABLE ALLOCATIONS
  A(R )=C5AC-002A   T(R )=C5A2        TF(R )=C5A4        T(R )=05A6
  JNC(X(1))=C5B6-C5B2   IP(1 )=05B8-05B7   HTR(I )=05BC        JP(I )=05AC-05A8
  IF(3(1))=05C0       IF4(1 )=05C1        IF5(I )=05C2        IF(I )=05BD
  IX(1 )=05C6       IV(1 )=C5C7       L2(I )=05C6        J(I )=05C4
                                         L(I )=05C9        P(I )=05CA
                                         L3(I )=05CB

STATEMENT ALLOCATIONS
  2CC=CSEA 5CC0=5SEE 22=C63F 23=C655 20=0661 27=0683 24=068A 21=06A5
  2=C6FB 32=C7C8 33=C71F 3C=C728 37=0746 34=C752 31=07A8 35=07CD 26=06D2

FEATURES SUPPORTED
  CNE BCRC INTEGERS
  STANCARD PRECISION
  ICCS-
  DISK
  L4C2 PRINTER
  PAPER TAPE
  CARC

CALLED SUBROUTINES
  PAGTA  FSUB  FCIV  FLD  FSTC  FSIC  FILCAT  CARDZ  PARTZ  SRED  SWRT  SCMP  SFIC  SIGAI  SIGF
  SUBSC  FRNZ  SCFIC  SCRED  SDAI  SCF  SCI
REAL CONSTANTS
  .1CCCCCE C4=C5D8  .1C0C0CE C3=C5DA  .CCCC00E 00=05DC  .100000E 02=05DE
INTEGER CONSTANTS
  2=C5EC  5=C5E1  7=C5E2  1=C5E3  4=05E4  1C0=05E5  0=05E6  30C=05E7  3=05E8  700=05E9

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OCRE REQUIREMENTS FOR -
CCP/CN- C, VARIABLES AND TEMPORARIES - 1456. CONSTANTS AND PROGRAM - 570

END OF SUCCESSFUL COMPILATION

1/ XEC 2

*FILES(1,G21,A22),(2,G22,A22),(3,TCP2,A22),(4,R21,A22),(5,R22,A22)

*FILES(7,PNTR,A22)

2ECAT 2E055 C.2C00CCCC12736.
28848 598 c18 12631384C832.
281 285 6 7

— A P O L L O 15 , Probe 2, Tape 3 —

